

Supplemental Material

Risk Estimation with Epidemiological Data when Response Attenuates at High Exposure Levels

Kyle Steenland¹, Ryan Seals¹, Mitch Klein¹, Jennifer Jinot², Henry D. Kahn²

¹ Rollins School of Public Health, Emory University

² National Center for Environmental Assessment, US EPA

Supplemental Material, Appendix 1. EC₀₁ calculation for breast cancer incidence, 2-piece log-linear model, 15-y lag, adjusted for all cause mortality

A	B	C	D	E	F	H	I	J	K	
age interval	US all cause female death rate in year 2000/100000	breast cancer rate from SEER 1997-2001/100000	Probability of survival in interval (rate to risk)	Cumulative probability (S) of surviving up to interval	conditional probability of breast cancer in interval	exposure duration (yrs) at midpoint Interval	cum exp midpoint interval, daily exposure 0.0152 ppm	exposed breast cancer rate in interval	conditional probability of breast cancer in interval for exposed	
15-19	40	0	0.998002	0.99078076	0	2.5	42.74	0	0	
20-24	49.5	1.4	0.99752806	0.988801179	6.913E-05	7.5	128.23	7.07E-05	6.98E-05	
25-29	64	8.4	0.99680511	0.986356922	0.00041361	12.5	213.72	0.000427	0.00042	
30-34	102.3	30	0.99489806	0.983205625	0.00147104	17.5	299.20	0.001534	0.001504	
35-39	179.1	72.9	0.99108498	0.978189368	0.00354958	22.5	384.69	0.003752	0.003653	
40-44	311.4	156	0.98455059	0.969468787	0.00750329	27.5	470.17	0.00808	0.00777	
45-49	481.8	255.3	0.97619785	0.954491062	0.01203849	32.5	555.66	0.013308	0.012542	
50-54	680.4	335.8	0.96655217	0.931772121	0.01538133	37.5	641.15	0.017617	0.016117	
55-59	979.8	422.6	0.95219065	0.900606368	0.0185712	42.5	726.63	0.022313	0.019565	
60-64	1396.1	480.8	0.93257565	0.857548965	0.0199124	47.5	812.12	0.02555	0.021084	
65-69	1982.6	535.4	0.90562497	0.799729287	0.02038184	52.5	897.60	0.028634	0.021684	
70-74	2859.6	577.5	0.8667714	0.724254811	0.01948658	57.5	983.09	0.031084	0.020822	
75-79	4287.6	592.9	0.80704165	0.627763359	0.01675046	62.5	1068.58	0.032119	0.017972	
80-84	6847.8	546.1	0.71007122	0.506631178	0.01171398	67.5	1154.06	0.029774	0.012618	
				Lifetime risk in US 0.14724 (sum column F)					Lifetime risk exposed 0.15582 (sum column K)	

$$D_i = \exp(-5 \cdot B_i)$$

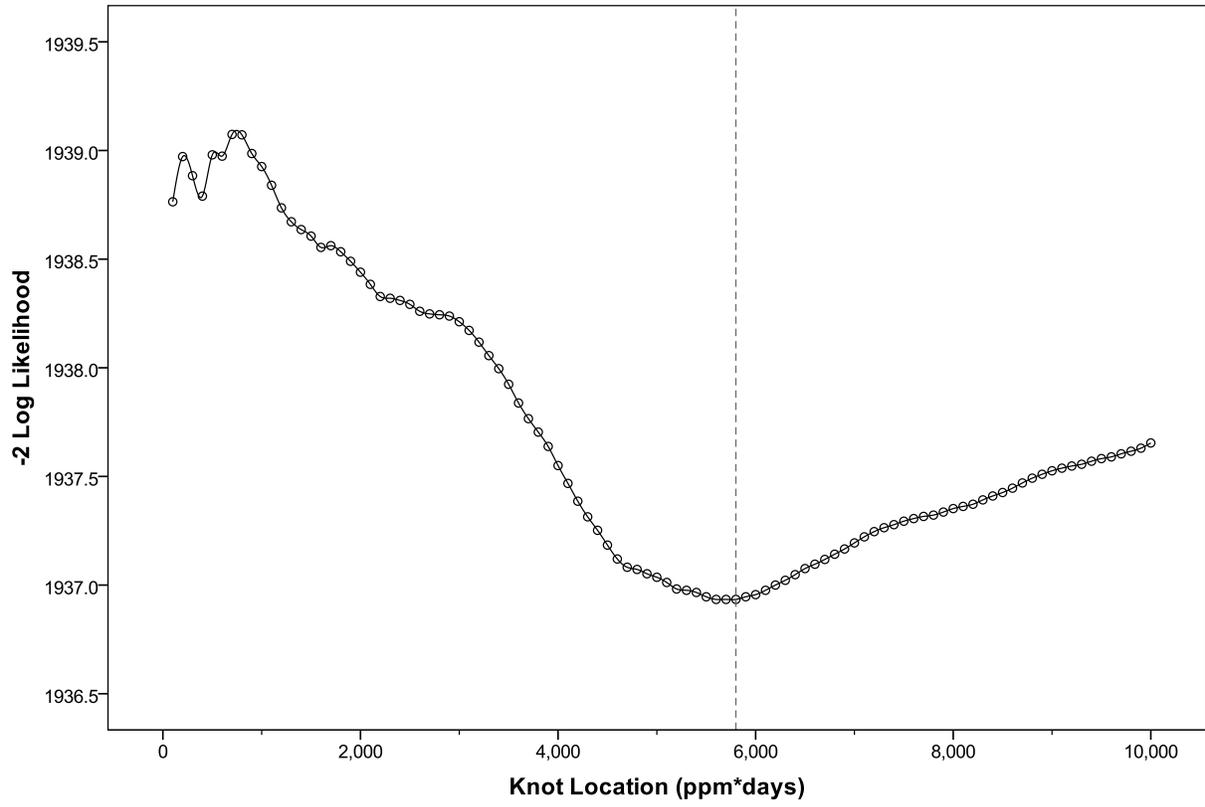
$$E_i = D_{i-1} \cdot E_{i-1}$$

$$F_i = (C_i / B_i) \cdot E_i \cdot (1 - D_i)$$

$I_i = 0.0152 \cdot (365/240) \cdot (20/10) \cdot 365 \cdot H_i$, converts environmental exposure to occupational (exp-response coefficient derived from occupational exposure) and converts to ppm-days

$J_i = C_i \cdot \exp(I_i \cdot \text{exposure response coefficient})$, here using coefficient for first piece log-linear spline (based on log RR model)

K_i , calculated analogously to F_i but using the J_i instead of C_i



Supplemental Material, Figure 1. Picking the knot for the 2-piece linear RR model based on model likelihood